

NICHOLAS R. CAVANAUGH

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Professional Interests

Climate and weather variability, uncertainty, and risk: machine/statistical learning, stochastic modeling, extreme value and non-Gaussian statistics, probabilistic forecasting, insurance and risk management

Education

Scripps Institution of Oceanography, UCSD, La Jolla, CA 2014
PhD in Oceanography/Climate Physics – Climate Research Division
Master of Science in Oceanography -- 2012
Advisors: Arthur Miller & Sasha Gershunov
University of Pennsylvania, Philadelphia, PA 2006 – 2010
Bachelor of Applied Science in Bioengineering (2010), *cum laude*
Minors: Mathematics and Environmental Studies
University of Washington, Seattle, WA 2007
Visiting student, interdisciplinary
SEA Education Association, Woods Hole, MA 2007

Employment and Research

Lawrence Berkeley National Laboratory, Postdoctoral Researcher, Berkeley, CA 2014 – current
Scripps Institution of Oceanography, UCSD, Graduate Researcher, La Jolla, CA 2010 – 2014
- Utilized large, sparse datasets of high-frequency (daily) weather information from ~90,000 weather stations to quantify the spatiotemporal evolution of temperature and precipitation probabilities, globally (Advisors: Dr. Sam Shen, SDSU, and Dr. Sasha Gershunov, SIO)
- Developed stochastic-dynamic models from climate databases (GCMs, observations) used for extended-range weather forecasting and probabilistic weather prediction (Advisor: Dr. Arthur Miller, SIO)
- Developed cluster analysis based techniques for delineating and quantifying geographically homogeneous climate regions based on high-frequency (daily) weather probabilities derived from historical observations (Advisor: Dr. Joel Norris, SIO)
Mendeley, Business Development Intern, New York, NY 2010
- Assisted in business development of a media technology startup including pricing, cost base analysis, user growth forecasting, recruitment, public relations/press releases, expenses, and promotional items
University of Pennsylvania Medical Image Processing Group, Philadelphia, PA 2009 – 2010
- Aided in the development of automatic anatomy recognition software used to delineate 3-D organs from high-resolution medical images (CT-scans) and quantify abnormalities relative to normal anatomic variability (Advisor: Dr. Jayaram Udupa, MIPG)
Scripps Institution of Oceanography, Intern, La Jolla, CA 2009
- Developed a numerical Lagrangian ocean dispersion model with parameterized small-scale turbulence from a high-resolution coastal ocean model (Advisor: Dr. Jules Jaffe, MPL)
University of Pennsylvania Center for Technology Transfer, Philadelphia, PA 2008

- Performed solar-panel market research for quantum-dot embedded solar panels
SEA Education Association, Woods Hole, MA 2007
- Surveyed shallow-water estuarine dynamics in Samana Bay, Dominican Republic

Teaching

1. **Environmental Challenges: Science and Solutions (ESYS 103 / MAE 124)**
Teaching Assistant, UCSD 2014
2. **The Atmosphere (SIO 20)**, *Teaching Assistant*, UCSD 2013
3. **Climate Change and Society (SIO 25)**, *Teaching Assistant*, UCSD 2012

Professional Affiliations and Service

1. **American Meteorological Society**, *Member* 2011 – current
2. **American Geophysical Union**, *Member* 2011 – current
3. **Reviewer:** *Chaos, Climate Dynamics, Ecology and Evolution, Journal of Atmospheric and Oceanic Technology, Journal of Theoretical and Applied Climatology, Weather and Forecasting*

Publications

1. **Cavanaugh N.R.** (2015) The Finance of Weather Risk in a Globalizing Market. *Bulletin of the American Meteorological Society*. In preparation.
2. **Cavanaugh, N.R.**, and Shen, S.S.P. (2015). Spatial Scaling Effects on the Statistical Moments and Their Trends of Global Daily Surface Air Temperature. *Journal of Climate*, Submitted, sub judice.
3. **Cavanaugh, N.R.**, and Gershunov, A. (2015). Probabilistic Tail Dependence of Precipitation on Spatiotemporal Scale in Observations, Reanalyses, and GCMs. *Climate Dynamics*, in press.
4. **Cavanaugh, N.R.**, Gershunov, A., Panorska, A.K., and Kozubowski, T.J. (2015). On the Probability Distribution of Daily Precipitation Extremes. *Geophysical Research Letters*, in press.
5. Klingaman, N.P., Woolnough S.J., Jiang J., Waliser D., Xavier P.K., Petch J., Caian M., Hannay C., Kim D., Ma H-Y., Merryfield W., Miyakawa T., Pritchard M., Ridout J., Roehrig R., Shindo E., Vitart F., Wang H., **Cavanaugh N.R.**, Mapes B., Shelly A., Zhang G. (2014) Vertical structure and diabatic processes of the Madden-Julian oscillation: Linking hindcast fidelity to simulated diabatic heating and moistening. *Journal of Geophysical Research*. In preparation.
6. Seo H., Subramanian A.C., Miller A.J., and **Cavanaugh N.R.** Coupled impacts of the diurnal cycle of sea surface temperature on the Madden-Julian Oscillation. *Journal of Climate*. Accepted.
7. **Cavanaugh N.R.**, Shen S.S.P. (2014) Non-Gaussian Surface Air Temperature Climatology Statistics and Trends in Observed Station Data. *Journal of Climate*. In Press. DOI: 10.1175/JCLI-D-13-00470.1
8. **Cavanaugh N.R.**, Allen T., Subramanian A.C., Mapes B., Seo H., Miller A.J. (2014) The Skill of Tropical Linear Inverse Models in Hindcasting the Madden-Julian Oscillation *Climate Dynamics*. In Press. DOI 10.1007/s00382-014-2181-x
9. Chavas D, Yonekura E, Karamperidou C, **Cavanaugh N.R.**, Serafin K. (2012) US Hurricanes and Economic Damage: An Extreme Value Perspective. *Natural Hazards Review*. 14(4), 237-246.

10. **Cavanaugh N.R.** (2007) An observational analysis of freshwater flow from the Yuna and Barracote Rivers and its impact on current, salinity and temperature of Samana Bay's estuarine environment. *SEA-209*.

Conference Presentations

1. **Cavanaugh N.R.**, and Shen S.S.P. On the multi-scale variability of daily surface air temperature. San Francisco, CA. Dec 2014. AGU Fall Meeting.
2. **Cavanaugh N.R.**, and Shen S.S.P. On the multi-scale variability of high-frequency surface air temperature: lessons from the intersection of statistical mechanics and climatology. St. Louis, MO. Oct 2014. 39th Annual Climate Diagnostics and Prediction Workshop.
3. **Cavanaugh N.R.**, Allen T, Subramanian A, Mapes B, Seo H, Miller A. Reduced Stochastic Climate Modeling: Practical Applications for Extended-Range Forecasting. Workshop on Non-equilibrium Statistical Mechanics and the Theory of Extreme Events in Earth Science. Isaac Newton Institute, Cambridge, UK. Oct, 2013.
4. **Cavanaugh N.R.**, Allen T, Subramanian A, Mapes B, Seo H, Miller A. Predictability and Coupled Dynamics of MJO During DYNAMO: Reduced Tropical Stochastic Climate Modeling & The MJO in CCSM4. ONR LASP Peer Review. Monterey, CA. Sept, 2013.
5. **Cavanaugh N.R.** Regional trends in the Statistical Distributions of Daily Temperature. 12th International Meeting on Statistical Climatology. Jeju, Korea. June 2013.
6. **Cavanaugh N.R.**, Subramanian A, Miller A. Forecasting of the Madden-Julien Oscillation with Linear Stochastic Climate Models. 12th International Meeting on Statistical Climatology. Jeju, Korea. June 2013.
7. **Cavanaugh N.R.**, Subramanian A, Miller A. MJO Forecasting with Linear Stochastic Climate Models. MJO Field Data and Science Workshop. Kona, Hi. Mar 2013.
8. **Cavanaugh N.R.** Regional trends in the Statistical Distributions of Daily Temperature. AGU Fall Meeting. San Francisco, CA. Dec 2012.
9. **Cavanaugh N.R.**, Katz M. Automatic Anatomy Recognition: Fuzzy Modeling of Critical Chest Organs. University of Pennsylvania, School of Engineering Thesis Meeting. Philadelphia, PA. May, 2010.

Invited Colloquia

1. Multi-Hazards Summer School for Graduates, Post-Graduates and Researchers: Prepare for high-impact disasters: towards the UN World Conference on Disaster Risk Reduction. (July 2014). Tohoku University, Sendai, Japan.
2. Non-equilibrium Statistical Mechanics and the Theory of Extreme Events in Earth Science (2013), Isaac Newton Institute, Cambridge, UK.
3. UCE3 Summer School in Environmental and Energy Economics (2013), UC-Berkeley, Berkeley CA
4. IMAGe Theme of the Year (Uncertainty Quantification, 2012), NCAR, Boulder CO
5. CESM tutorial (2011), NCAR, Boulder CO
6. ASP Summer Colloquium (Extremes, 2011), NCAR, Boulder CO

Awards & Honors

1. Wyer Fellowship (Scripps Institution of Oceanography, 2013)
2. Becker Fellowship (Scripps Institution of Oceanography, 2011-2012)

3. Director's Fellowship (Scripps Institution of Oceanography, 2010)
4. Dean's List (University of Pennsylvania, 2010)

Computer Language Proficiencies

- Expert: MATLAB, R
- Proficient: NCL, Bash scripting
- Basic: FORTRAN, C, C++, Java

Personal Interests

- Cars & mechanics, cooking & eating, surfing & snowboarding, fitness (weight lifting), travel
- Custom personal computing hardware, electronics and gadgets